

### **WHAT IS CLAIMED IS:**

1. A multi-stage reciprocating vacuum pump, comprising a housing (1); at least one first pump chamber (2) and at least one second pump chamber (4) provided in the housing (1) and each having a suction side (16, 17) and an outlet side (15, 19); a piston (6,8) reciprocating in each of the at least one first pump chamber (2) and the at least one second pump chamber (4); a valve (10, 19) provided at the outlet side (15, 19) of each of the at least one first pump chamber (2) and the at least one second pump chamber (4); a first conduit (14) for communicating the outlet side (15) of the at least one first pump chamber (2) with the suction side (17) of the at least one second pump chamber (4); a second conduit (20) for communicating the suction side (16) of the at least one first pump chamber (2) with the suction side (17) of the at least one second pump chamber (4); and means (18, 21; 25) for selectively connecting the first conduit (14) and the second conduit (20) with the suction side (17) of the at least one second pump chamber (4), the first and second conduits (14 and 20) and the selectively connecting means (18, 21; 25) being located in the housing (1).

2. A reciprocating vacuum pump as set forth in claim 1, wherein the selectively connecting means comprises first and second shut-off elements (18, 21) arranged in the first and second conduits (14, 20), respectively.

3. A reciprocating vacuum pump as set forth in claim 1, wherein the selectively connecting means comprises a three-way cock (25) provided at the intersection of the first and second conduits (14, and 20).

4. A reciprocating vacuum pump as set forth in claim 1, further comprising a discharge connection (13), provided at the outlet side (15) of the at least one first pump chamber (2) and a third shut-off element (23) provided at the discharge connection (13).

5. A method of operating a multi-stage reciprocating vacuum pump having a housing, at least one first pump chamber (2) and at least one second pump chamber (4) provided in the housing (1) and each having a suction side (16, 17) and an outlet side (15, 19), a piston (6, 8) reciprocating in each of the at least one first pump chamber (2) and the at least one second pump chamber (4), a valve (10, 11) provided at the outlet side (15, 19) of each of the at least one first pump chamber (2) and at least one second pump chamber (4), a

first conduit (14) for communicating the outlet side (15) of the at least one first pump chamber (2) with the suction side (17) of the at least one second pump chamber (4); the method comprising the steps of providing a second conduit (20) for communicating the suction side (16) of the at least one first pump chamber (2) with the suction side (17) of the at least one second pump chamber (4), and means (18, 21; 25) for selectively connecting the first conduit (14) and the second conduit (20) with the suction side (17) of the at least one second pump chamber (4); moving the selectively connecting means to a first position thereof in which the second conduit (20) is connected with the suction side (17) of the at least one second pump chamber (4), and the first conduit (14) is disconnected from the suction side (17) of the at least one second pump chamber (4), whereby gas entering through the suction side (16) of the at least one first pump chamber (2) is pumped, in parallel, in the at least one first pump chamber (2) and the at least one second pump chambers (4) and is expelled through the respective valves (10, 11) provided at the outlet sides (15, 19) of the at least one first pump chamber (2) and the at least one second pump chamber (4), respectively; and closing a discharge connection (13) provided at the outlet side (15) of the at least one first pump

chamber (2) and moving the selectively connecting means to a second position thereof in which the second conduit (20) is disconnected from the suction side (17) of the at least one second pump chamber (4), and the first conduit (14) is connected with the suction side (17) of the at least one second pump chamber (4), whereby gas entering through the suction side (16) of the at least one first pump chamber (2) is compressed in the at least one first pump chamber (2), flows therefrom through the first conduit (14) into the at least one second pump chamber (4), is further compressed therein, and is expelled through the valve (11) provided at the outlet side (19) of the at least one second pump chamber (4).

6. A method as set forth in claim 5, wherein the selectively connecting means comprises first and second shut-off elements (18, 21) arranged in the first and second conduit means (14, 20), respectively, wherein the step of moving the selectively connecting means to a first position thereof includes closing the first shut-off means (18) and opening the second shut-off means (21), and wherein the step of closing the discharge connection (13) and moving the selectively connecting means to a second position thereof includes

closing a third shut-off element (23) provided at the discharge connection (13), and opening the first shut off means (18).

7. A method as set forth in claim 5, wherein the selectively connecting means comprises a three-way cock, wherein the step of moving the selectively connecting means (25) to a first position thereof includes moving the cock to a first position thereof in which the second conduit is connected with the suction side (17) of the at least one second pump chamber (4), and the first conduit (14) is disconnected from the suction side (17) of the at least one second pump chamber (4), and wherein the step of closing the discharge connection (13) and moving the selectively connecting means to a position thereof includes closing the second shut-off element (21) and a third shut-off element (23) provided at the discharge connection (13), and moving the cock to a second position thereof in which the second conduit (20) is disconnected from the suction side (17) of the at least one second pump chamber (4), and the first conduit (14) is connected with the suction side (17) of the at least one second pump chamber (4), whereby gas entering through the suction side (16) of the at least one first pump chamber (2) is compressed in the at least one first pump chamber (2), flows therefrom through the first conduit (14) into the at least one

second pump chamber (4), is further compressed therein, and is expelled through the valve (11) provided at the outlet side (19) of the at least one second pump chamber (4).